King County
Department of Natural Resources and Parks
Water and Land Resources Division
Noxious Weed Control Program
206-296-0290 TTY Relay: 711

BEST MANAGEMENT PRACTICES

Meadow Knapweed - *Centaurea jacea x nigra*
Spotted Knapweed - *Centaurea biebersteinii*
Diffuse Knapweed - *Centaurea diffusa*

Asteraceae

Class B Noxious Weeds

Description

- Threatens wildlife habitat and pastures and causes problems for tree growers. (see Impacts on page 4).
- Perennials or biennials that form **flowers in heads similar to thistle flowers** but have leaves without spines. Leaves are typically blue-green and can be deeply lobed.
- Begin as rosettes in the spring and develop flowering stems early in the summer.

Spotted knapweed

- Flower heads are small, oval with **light purple flowers** like Canada thistle and have obvious vertical veins below the black triangular spot on the bract tip.
- Perennial with several upright-branched stems up to 5 feet tall from a stout taproot.
- Leaves are highly lobed and sparse.

Diffuse knapweed

- Biennial or short-lived perennial that is shorter than spotted knapweed.
- Growing from a deep taproot, its upright stems have numerous spreading branches giving the plant a ball shape.
- Flower heads are small, yellowish green with spines on the edges with **white flowers** (sometimes pink to purple). Flower heads are solitary or in clusters of two or three at the ends of the branches.

Meadow knapweed

- Flower heads are round and fairly large, light golden brown and somewhat shiny with **bright pink flowers** like a bull thistle or red clover.
- Has one to several upright-branched stems from 20 to 40 inches tall from large root.
- Leaves are variable but usually coarsely lobed and long, larger at the base of the plant and smaller on the upper stem.

Habitat

- In King County, usually found along roadsides, railroads, industrial properties, gravel pits, overgrazed pastures, gravelly riverbanks and vacant properties.
- Prefers full sun and well-drained soils although meadow knapweed is tolerant of partial shade and moister sites.
- Many infestations start on rights-of-way or from infested gravel or fill.

Reproduction

- Spotted knapweed flowers continuously from early summer into the fall, as long as moisture and temperatures permit. Meadow knapweed usually flowers from May through July. Diffuse knapweed usually starts flowering in June and July.
- Meadow and spotted knapweed reproduce by seed and crown. Diffuse knapweed may regenerate from the root crown but it reproduces primarily by seed.
- Seed heads open when mature and any slight disturbance causes the seeds to be expelled. Seeds usually fall within a three-foot radius.

- Seeds are transported by automobiles, in contaminated fill and gravel and by wildlife. Diffuse knapweed seeds are also dispersed when the plant breaks off at the base and is blown by the wind.
- Seeds can remain viable up to eight years. Seeds below depths of one and a half inches will not germinate until the soil is disturbed.
- Meadow knapweed escapes from ornamental plantings into adjacent properties.

Control Methods

The preferred method of control is Integrated Pest Management (IPM). IPM involves selecting from a range of possible control methods to match the management requirements of each specific site. The goal is to maximize effective control and to minimize negative environmental, economic and social impacts.

Control methods should be multifaceted and adaptive, developed to reflect the available time, funding, and labor of the participants, the land use goals, and the values of the community and landowners. Management will require dedication over a number of years, and should allow for flexibility in method as appropriate.

Management Plan

- For small sites with limited distribution, pull or dig up plants and remove as much root as possible so the plant will not re-sprout. Carefully monitor sites throughout the growing season to remove missed plants. Expect the level of control work to be intensive for the first several years due to seed banks and the soil disturbance that occurs when pulling or digging.
- Larger infestations can be treated with an appropriate herbicide for the site. Monitor the site throughout the growing season to catch any missed plants.
- For areas that have competitive grass species present, a fertilization and irrigation regime will greatly reduce the growth of knapweed. Areas that do not have competitive vegetation should be seeded whenever possible.
- Mowing alone is not recommended for control. Since the plant has the ability to flower below the mower height, mowing alone will not prevent seed production.

Early Detection and Prevention

- Survey for flowering and pre-flowering knapweed from **May to July** along roadsides, railroads, unmanaged grasslands and industrial areas.
- Isolated small populations can be dug up but the site should be monitored for several years to look for plants growing from root fragments and from the seed bank.
- Prevent plants from spreading from existing populations by washing vehicles, boots and animals that have been in infested areas. Seeds are small and are easily carried in mud and in animal fur.

Manual

- **Pull or dig up small infestations including the entire root** if possible. Plants in sandy soil pull easily but those in hard-packed soil will require a shovel or stout trowel.
- Plants are most susceptible to hand pulling if the soil is still moist and uncompacted. Roots still tend to break off four to six inches beneath the ground. A small percentage of these root fragments will resprout.
- Sites where weeds are pulled need to be watched closely for new rosettes and re-sprouts throughout the growing season. The disturbed soil from pulling and digging aids in germination of any seeds present.

Mechanical

- **Plants that are periodically mowed will generally continue to flower** and produce seed on shorter plants below the mower blade height.

- Cultivation can bury seeds and plant parts under the soil surface and repeated cultivation can be effective if combined with monitoring for and controlling re-sprouts.
- Provide a healthy cover crop to help prevent knapweed from re-establishing.

Biological

There are several approved biological control agents for knapweed control. For most effective control, use a combination of several different kinds of insects on an infestation. Some biocontrol agents that may be effective in King County include:

- Gall flies, (*Urophora affinis* and *Urophora quadrifasciata*), feed on the developing seed heads and can dramatically reduce seed production in diffuse and spotted knapweed. These insects co-exist well and are both available for collection throughout the northwest.
- Sulphur knapweed moth (*Agapeta zoegana*) attacks the roots of spotted knapweed killing young plants and stopping large plants from flowering. Favorable habitats are temperate and humid. Established in parts of Washington but difficult to collect.
- Green clearwing fly (*Terellia virens*) attacks the seeds of spotted and to a lesser extent diffuse knapweed. Available from Oregon in limited quantities.

Chemical

- Chemical control options may differ for private, commercial and government agency users. Follow all label directions. Herbicides should only be applied at the rates and for the site conditions / land usage specified on the label.
- **Certain herbicides can not be used in aquatic areas or their buffers**. If herbicides are used, make sure that their use is allowed at your site. Contact your local noxious weed control program for control guidelines in your area.
- Several herbicides are recommended by the PNW Weed Control Handbook for knapweed control. For site specific herbicide recommendations, please contact the King County Noxious Weed Control Program.
- The addition of a suitable surfactant to the herbicide may improve the control results.
- Non-selective herbicides are effective but may damage grass and other vegetation. Treatment with a non-selective herbicide needs to be followed by re-seeding with grass. Without re-seeding, bare areas will be re-infested from the seed bank and by any missed plants.
- Selective herbicides that target only broadleaf plants may be used in grassy areas.

Control in Pastures

- **These recommendations are only for noxious weed control in areas where herbicides can legally be used**.
- Grazing should be managed to encourage grass vigor. A combination of herbicide treatment and nitrogen fertilizer should be used. Fertilizer alone will not work. It will only result in healthier, bigger weeds.
- Suppression with a selective herbicide will greatly increase grass production, which in turn increases the suppression of the knapweed.
- Apply a nitrogen fertilizer after the selective herbicide application, then manage grazing so that 4 to 6 inches of grass re-growth remains at the end of the growing season to allow grasses to resist re-invasion by the knapweed.
- Overgrazing will allow for spread of knapweed in pasture areas. Livestock will avoid knapweed unless it is the only forage available.

Additional Information

Legal Status in King County: **Class B Designate** (non-native species designated for control in regions where it is not widespread). **The King County Noxious Weed Control Board requires property owners to control Meadow, Spotted, and Diffuse Knapweeds on private and public lands throughout the county.**

Local Distribution

Knapweed is found throughout King County from Puget Sound to Snoqualmie Pass. Spotted knapweed is most common on state highways and railroads and in Auburn, Kent, Renton, south Seattle and other parts of south King County but is also found in Kirkland, Shoreline, Redmond and Woodinville. Diffuse knapweed is mostly found on highways, railroads and in urban and industrial areas of the county. Meadow knapweed is most frequently found on highways and in Kirkland but is also found in Enumclaw, Maple Valley, Covington, Bellevue, Kent, Renton and rural King County.

Impacts and History

- Knapweeds are highly competitive plants that can exclude more desirable plants and form large, dense infestations.
- Can quickly invade disturbed sites and from these areas invade relatively undisturbed, beneficial plant communities.
- Threatens wildlife habitat and pastures and causes problems for tree growers.
- Knapweed invasions cause losses averaging up to 63 percent of available grazing forage.
- Spotted, diffuse and meadow knapweed are native to Europe.

References

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